

Detailed Syllabus

Sixth Semester

L: 3
T: 1
P: 0

ET 661 Microcontrollers and Embedded System

Theory: 100 marks

Sessional: 75 marks

Time: 3 hours

Objectives:

- To have knowledge about the basic working of a microcontroller system and its programming in assembly language.
- To provide experience to integrate hardware and software for microcontroller applications systems.

Course Outcomes:

The students will

- Acquire knowledge about microcontrollers embedded processors and their applications.
- Understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.
- Be able to write the programs for microcontroller.
- Understand the role of embedded systems in industry.
- Understand the design concept of embedded systems.

UNIT 1: Introduction to Microcontrollers

[7hours]

Microprocessors v/s Micro-controllers, Types of Micro-controllers; External memory, Processor Architecture – Harvard v/s Princeton; CISC v/s RISC, Micro-controller Memory types – control storage; variable area; stack; hardware register space, Micro-controller features –clocking; I/O pins, Interrupts, Timers, Peripherals.

UNIT 2: 8051 Microcontroller

[15hours]

The CPU, addressing modes, external addressing, Interrupt handling, Instruction execution, Instruction set, Software development tools like assemblers; simulators; cross-compilers, O/P file formats.

Hardware Features : 8051 – Device packaging, Chip technology, Power considerations, Reset, System clock/oscillators, Parallel I/O, Timers, Interrupts, Serial I/O, Control store and External memory devices. Programming using assembly and embedded C language.

UNIT 3: Other Microcontrollers

[6hours]

PIC Micro-controllers – overview; features, PIC-18 architecture, Interrupts, I/O ports, Timers, Capture/Compare/PWM module, Master Synchronous Serial Port module, USART, ADC.

AVR 8515 microcontroller: Architecture and Programming in assembly and embedded C.

UNIT 4: Interfacing

[7hours]

Interfacing & Microcontroller Applications :LEDs, Push Buttons, Relays, Latch connections, Keyboard, Seven Segment and LCD displays interfacing, I2C bus operation, Serial EEPROM. Software development tools.

UNIT 5: Embedded Systems

[5hours]

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas.

Embedded Firmware: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

Textbooks:

1. Mazidi & McKinlay,” *The 8051 Microcontroller and Embedded Systems using Assembly and C*”, PHI.
2. Myke Predko,” *Programming and Customizing the 8051 Micro-controller*”, Tata McGraw-Hill.
3. R A Gaonkar, “*Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC18 Microcontroller Family)*”, Penram Publishing India.
4. Raj Kamal, “*Embedded Systems*”, TMH.
5. AVR 8515 manual.

Reference books:

1. Kenneth J. Ayala, Dhananjay V. Gadre, “*The 8051 Microcontroller & Embedded Systems Using Assembly and C*”, Cengage Learning India Publication.
2. Shibu K ,”*Embedded Systems*”, Tata McGraw Hill Publishing.

L: 3
T: 1
P: 3

ET 662 Microwave Engineering
Theory: 100 marks
Sessional: 50 marks
Practical: 50 marks

Objectives:

- To understand the basics of transmission lines and their solutions.
- To understand the basics of electromagnetism and waveguides
- To study various microwave tubes and different semiconductor devices.
- To study the applications of microwaves.

Course Outcomes:

The students will be able to

CO1	Able to apply electromagnetic theory to calculations regarding waveguides and transmission lines.
CO2	Able to describe, analyze and design simple microwave circuits and devices e g matching circuits, couplers, antennas and amplifiers.
CO3	Able to describe common devices such as microwave vacuum tubes, high-speed transistors and ferrite devices.
CO4	Able to handle microwave equipment and make measurements.
CO5	Apply the knowledge of scattering matrix to different types of junction devices.

UNIT 1: Introduction to Microwaves

[3 hours]

History of Microwaves, Microwave Frequency bands. Applications of Microwaves: Civil and Military, Medical, EMI/ EMC

UNIT 2: Transmission Lines

[8hours]

Review of transmission line theory. Co-axial cable. MIC lines. Characteristic impedance, Standing waves. VSWR and reflection coefficient. Smith chart. Stub matching. Quarter wave transformer

UNIT 3: Waveguides

[7 hours]

Rectangular and circular waveguides. Solution of wave equations. TE and TM modes. Dominant mode. Field Patterns. Cut-off frequencies. Wave impedance. Power transmission. Waveguide resonators.

UNIT 4: Network Representation

[5 hours]

Scattering matrix parameters.

UNIT 5: Microwave Passive Circuit Components**[7 hours]**

Directional couplers, isolators, circulators, power splitters, E-, H- and magic Tees. Attenuators, phase shifters. Short circuit and matched terminations. Filters.

UNIT 6: Microwave Devices**[7 hours]**

High frequency limitations. Klystrons, magnetrons, TWTs. Microwave transistors - bjts and GaAs MESFETs. Transferred electron devices, avalanche transit-time devices. Read diode, IMPATT diode. BARITT diode and the tunnel diode. Parametric devices. Quantum electronic devices. MASERS and LASERS.

UNIT 7: Microwave integrated circuits**[3 hours]**

Planar transmission lines, characteristics of microwave integrated circuits; design of single stage amplifier and oscillator using transistor; PIN diode based control circuits

Text Books:

1. S. Y. Liao, "Microwave Devices and Circuits", Prentice Hall of India.

References:

1. M. M. Radmanesh, "Radio Frequency and Microwave Electronics", Pearson Education Asia.
2. R. E. Collin, "Foundation for Microwave Engineering", McGraw-Hill.
3. K. C. Gupta, "Microwaves", John Wiley and Sons.

L: 3
T: 1
P: 3

ET 663 Digital System Design
Theory: 100 marks
Sessional: 50 marks
Practical: 50 marks
Time: 3 hours

Objectives:

- To use state machine diagrams to design finite state machines using various types of flip-flops and combinational circuits with prescribed functionality.
- To prepare students for the design of practical digital hardware systems using HDL

Course Outcomes:

The students will be able to

CO1	Analyze and design Moore and Mealy FSM.
CO2	Analyze, synthesize and design race free asynchronous sequential circuit in fundamental mode of operation.
CO3	Explain the code Structure, data Types, operators and attributes of VHDL Programming.
CO4	Use VHDL for implementing basic combinational and sequential circuits.
CO5	Model and simulate complex digital systems using VHDL.

UNIT 1: Basics of VHDL

[12hours]

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements.

Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

UNIT 2: HDL Modeling of Combinational Logics

[10hours]

Combinational logic circuit design and VHDL implementation of following circuits – first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

UNIT 3: HDL Modeling of Sequential-Circuit Building Blocks

[13hours]

Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC)

Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, clock skew and timing considerations. State diagram modeling.

UNIT 4: Memory and Programmable logic

[5hours]

Memory classification and description; Combinational PLDs; PROM, PAL, PLA: Sequential PLDs: Sequential (simple) Programmable logic Devices (SPLD), Complex Programmable logic devices (CPLD), Field Programmable Gate Array (FPGA)

Text Books:

1. VHDL – 3rd Edition – Douglas Perry – TMH
2. Fundamentals of Digital Logic with VHDL design – Stephen Brown, Zvonko Vranesic – TMH.
3. M. Morris Mano,” *Digital Design*”, Prentice Hall of India
4. J. Bhaskar, “*VHDL Primer*”, PHI

References:

- 1 .J. Frederic and G. R. Peterson,” *Digital Systems: Hardware Organization and Design*”, John Wiley and Sons, 3/e.

L:3
T:1
P:3

CS678 Data Structure and Algorithm
Theory: 100 Marks
Sessional: 50 Marks
Practical: 50 Marks
Time: 3 hours

Objectives:

- To provide knowledge in various data structures and algorithms.
- Applications of the data structures in various fields.
- Writing of efficient programs in connection with time complexity and space complexity.

Course Outcomes:

The students will be able to

CO1	Apply asymptotic notations to evaluate the performance of different algorithms.
CO2	Apply linear and nonlinear data structure to solve problems.
CO3	Apply various sorting, searching and hashing algorithms to solve problems.
CO4	Explore different types of file structures
CO5	Use appropriate data structures and apply them to design algorithms for a particular problem

UNIT 1: Introduction to Algorithms

[6hours]

Time and Space analysis of Algorithms -Order Notations. Concepts in algorithm analysis, asymptotic complexity. Different algorithm design techniques.

UNIT 2: Linear Data Structures

[7 hours]

Sequential representations Arrays and Lists, Stacks, Queues, Strings and pattern matching algorithms; Link Representations- Linear linked lists, Circular linked lists, Doubly linked lists; Applications. Recursion –Design of Recursive Algorithms, Tail Recursion.

UNIT 3: Sorting and Searching

[7 hours]

Bubble sort, Selection sort, Insertion sort, Quick sort, Merge sort, Heap sort, Radix sort.

UNIT 4: Nonlinear Data Structures

[7 hours]

Trees –Binary Trees, Traversals and Threads, Binary Search Trees, Insertion and Deletion algorithms, Height Balanced Trees and Weight Balanced Trees, B-trees, B+ trees, Application of trees. Graphs –Representations, Breadth-first and Depth-first Search , Spanning trees: Prim's and Kruskal's algorithm.

UNIT 5: Hashing

[7 hours]

Hashing Functions, Collision Resolution Techniques.

UNIT 6: File Structures

[6hours]

Sequential and Direct Access, Relative files, Indexed files, Multi-index files, Hashed files.

Textbooks:

1. Data Structures and Algorithms, A. V. Aho, J. E. Hopcroft, J. E. Ullman, Addison Wesley.
2. Fundamentals of Data Structures, E. Horowitz, S. Sahni, Galgotia Publication.
3. Data Structures using C, A. S. Tanenbaum
4. Algorithms, Data Structures, and Problem Solving, Addison Wesley.
5. Data Management and File Structures, Loomis, Marry, PHI
7. Lipshutz –Theory and Problems of Data Structures, McGraw Hill.
8. Data Structures Through C/ C++ Yashavant Kanetkar, BPB Publication.

L:3
T:1
P:0

CS679 Computer Communication Networks

Theory: 100 Marks
Sessional: 50 Marks
Time : 3 hours

Objectives:

- Study of architecture and protocols of computer networks.
- To define computer networks and describe their purpose, network media and data transmissions
- To explain network design and describe the various network topologies local area network architectures.
- To discuss medium access control and retransmission protocols; protocol analysis and verification; data communication principles, including circuit switching and packet switching; routing and flow control; topics in security and privacy, DNS and network applications.
- To discuss the Internet and its tools.
- Introduction to network simulators and implementation of network software.

Course Outcomes:

The students will be able to

CO1	Explain the basic computer networks and describe different reference model.
CO2	Will be able to explain different transmission media, error detection and corrections and understand different medium access protocols.
CO3	Will be able to explain sub netting, flow control, routing, queuing and congestion control in the network layer.
CO4	Will be able to describe connection oriented and connectionless protocol in transport layer.
CO5	Will be able to describe authentication, security and various protocols of the application layer.

UNIT 1: Introduction to computer networks

[4 hours]

Network goals, application structures, architectures of different technologies, OSI Model and services, ATM, Network examples.

UNIT 2: Physical layer

[5 hours]

Transmission medium, telephone system. RS-232C, RS-449 standards. α 21 switching, ISDN and terminal handling.

UNIT 3: Data link layer

[5 hours]

Framing, error detection and correction and data link protocols- HDLC, SLIP and PPP

Unit 4: Medium access sub-layer**[5 hours]**

ALOHA, CSMA, CSMA/CD, Collision free protocol, BRAP, MLMA etc. IEEE standard 802.3, Ethernet, token ring. FDDI, satellite networks and packet radio networks.

UNIT 5: Network layer**[8 hours]**

Routing algorithms, Circuit switching, Packet switched networks, IP, ARP, RARP, DHCP, ICMP, RIP, OSPF, Subnetting, CIDR, Interdomain routing, BGP, Ipv6, Multicasting, Congestion avoidance in network layer, flow control, queuing theory, analytical treatment of M/M/I and M/M/M.

UNIT 6: Transport layer**[5 hours]**

Elements of Transport protocol, TCP/IP, UDP, RPC, Wireless TCP and UDP, Case study of computer communication networks.

UNIT 7: Application layer**[8 hours]**

Network security, Authentication, IP Security, Email (SMTP, MIME, IMAP, POP3), HTTP, DNS, SNMP, Telnet, FTP, PGP, SSH

Textbooks/References

1. Dimitri Bertsekas & Robert Gallager – Data Networks. PHI, 1992, 2/e.
2. W. Stallings - Data and Computer Communications, Prentice Hall, 1997.
3. A. S. Tannenbaum - Computer Networks. PHI, 1997, 3/e.
4. Behrouz A Forouzan- Data Communication and Networking, McGraw-Hill Education.